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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/550,209	09/21/2005	Akihiko Okada	Q90267	1713

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EXAMINER	
NELSON, MICHAEL E	

ART UNIT	PAPER NUMBER
1794	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/550,209	OKADA ET AL.	
	Examiner	Art Unit	
	MICHAEL E. NELSON	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/21/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

2. On page 33, on the 3rd to last line, **polymerizztion** should be corrected to **polymerization**.

3. On page 54, the last line, **Usuallu** should be corrected to **Usually**.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-9 and 12-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Uckert et al. (US 2004/0185302).

6. Concerning claims 1-9, Uckert et al. describe polymer materials composed of poly(9,9-dialkylfluorene). The polymer is synthesized by reacting 2,7-dibromo-9,9-dialkyl fluorene (per claims 5-6) with bis (1,5-cyclooctadiene)nickel(0) (Ni(0) complex, per claim 6), 2,2'-bipyridyl, and 1,5-cyclooctadiene (200% by mole based on the total amount of monomer present, per claims 7-8). (see example 1, [0051]-[0052]) The

polymer was not analyzed to determine what formed the terminal group of the polymer. However, given the fact that the polymer is prepared using a method nearly identical to Applicant's method, it is the examiner's position that, absent evidence to the contrary, the polymer described would inherently have cyclooctadiene groups at the terminal ends of the polymer, since it is prepared using the same reagents. Uckert et al. do not report the polystyrene reduced weight-average molecular weight of the polymer, but since it is produced by a method so similar to Applicant's method, it would be predicted to have a similar molecular weight, and would meet the limitation of claim 1 especially given the claimed weight range of 100 to 100,000,000.

7. Concerning claim 12-13, Uckert et al. utilize the polymer synthesized as the light emitting layer of an electroluminescent device, which is by definition, a flat light source (per claim 13). (see example 4, [0065]-[0066])

Claim Rejections - 35 USC § 103

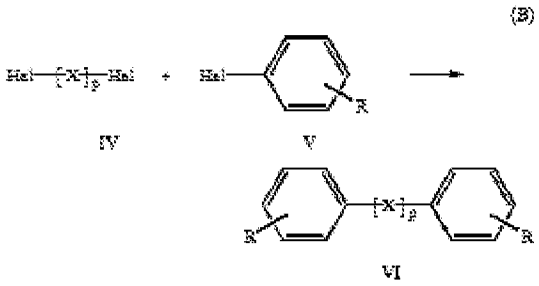
8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-3 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (6,107,452).

10. Concerning claims 1-3, Miller et al. describe polymer materials where the terminal of the polymer is functionalized by an unsaturated hydrocarbon group free from

an aromatic ring. The hydrocarbon group having the general structure shown below (formula B, column 5, lines 36-50), where X is selected to correspond to the use of the ultimately prepared electroactive polymer, including fluorenes, specifically 9,9-dialkylfluorenes (column 7, lines 1-4), and where R is a reactive group comprising a thermally or photochemically polymerizable functionality. Typically R contains an unsaturated bond (column 7, lines 13-16). Suitable groups include hydrocarbons having the formula $-(CH_2)_m-CH=CH_2$ (column 7, lines 27-28), where m is an integer in the range of 1 to 12, typically 1-6. (column 7, lines 46-47)



11. According to the above formula the formula of the unsaturated hydrocarbon (where m is 6), would correspond to C_8H_{15} (corresponding to i = 8, and j = 0, per claims 2 and 3). Miller et al. give examples of polymers according to the above structure, which have, for example, M_n of 5000 (Daltons) (column 10, line 67). While Miller et al. do not report a specific polystyrene reduced weight average molecular weight, given the wide range available in claim 1 (5 orders of magnitude from 100 to 100000000), it would be predicted that these polymers would fall within that range.

12. Miller et al. are silent on polymer material where the unsaturated hydrocarbon is directly coupled with the repeating unit. In the polymer material described by Miller et al., the unsaturated hydrocarbon is coupled to the polymer through a phenyl group.

However, the phenyl group simply serves as a means to couple the crosslinkable endcap with the polymer. Since the important function of the unsaturated hydrocarbon is to provide a means of crosslinking the polymer, it would have been obvious to one of ordinary skill in the art to couple the unsaturated hydrocarbon substituent directly to the polymer, or to synthesize a modified monomer, identical to one of the monomers of the polymer, incorporating the unsaturated hydrocarbon substituent, for the purpose of coupling the crosslinkable substituent to the polymer, since the resulting polymer would be predicted to function in the same way.

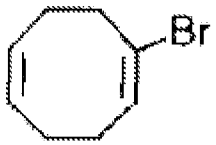
13. Concerning claim 12-13, Miller et al. describe the polymer material discussed above, and describes the use of the material in the light-emitting layer of an organic electroluminescent device (example 4, column 11, line 65-column 12, line 15), which is by definition a flat light source (per claim 13).

14. Claims 4-6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (6,107,452) as applied to claims 1-3 above, and further in view of Bandodakar et al. (Synthesis, vol. 9, pp. 843-844, 1990)

15. Concerning claim 4, Miller et al. describe the polymer material where the terminal is substituted by an unsaturated hydrocarbon as discussed above. Miller et al. are silent on the use of a cyclooctadienyl group as the terminal substituent. Since the nature of the unsaturated hydrocarbon substituent serves to provide a means for crosslinking the polymer, and therefore requires only a double bond, a cyclooctadiene substituent would be predicted to serve the same function, and therefore it would have

been obvious to one of ordinary skill in the art to use a cyclooctadiene substituent as the double bond containing substituent in the polymer described by Miller et al.

16. Bandodakar et al. disclose the synthesis of 1-Bromo-1,5-cyclooctadiene (shown below). Given the readily available starting material, it would have been obvious to one of ordinary skill to use the material either to create a modified monomer unit with the cyclooctadiene substituent, as discussed above, or to use the cyclooctadiene unit shown below as the endcapping group, since it would be predicted to react in the same manner.



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17. Concerning claims 5-6, and 9, Miller et al. describe the method to synthesize the polymer material, by means of example. A reaction mixture containing bis(1,5-cyclooctadiene)nickel(0) (a nickel(0) complex, per claim 6), and a monomer unit of 2,7-dibromo-9,9-di-n-hexylfluorene (which corresponds to Y_1-Ar_1-Y_2, where Y_1 and Y_2 are both a halogen (leaving group), and Ar_1 is 9,9-di-n-hexylfluorene, per claims 5-6), and a terminating group (exemplified by 4-bromostyrene). As discussed above, it would have been obvious to one of ordinary skill to use the cyclooctadiene unit above as the terminating group (instead of 4-bromostyrene), since it would be predicted to react in the same way, and provide a double bond for crosslinking, as described by Miller et al., to produce a polymer (per claim 9)

18. Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (6,107,452) and Bandodakar et al. (Synthesis, vol. 9, pp. 843-844, 1990) as applied to claims 4-6 and 9 above, and further in view of Iyer et al. (Tetrahedron Letters, vol. 38, no. 49, pp. 8533-8536, 1997).

19. Concerning claims 7-8, Miller et al. describes polymer material with unsaturated hydrocarbon substituents at the terminals, while Bandodakar et al. describe a material which would serve as a terminating group, since it would be predicted to react in the same manner as an arylbromide. They are silent on the use of cyclooctadiene, where Y_7 is a hydrogen as the terminating group.

20. Iyer et al. describe the reaction of un-halogenated alkenes with aryl and vinyl halides, and show that they can be coupled together by the use of nickel(0) reagents. (see example 7, in Table 1). Given this teaching, one of ordinary skill would predict that cyclooctadiene (per claim 8) where Y_7 is a hydrogen, would react in the presence of a nickel(0) complex with the aryl halide of the polymer, and serve as a terminating group, as described by Miller et al. The amount of the terminating unit is varied to control the length of the polymer, and it would have been obvious to one of ordinary skill to adjust the amount of terminating reagent to tailor the length of the polymer. Furthermore, given the slower reactivity between unsubstituted alkenes and aryl halides compared with aryl halides to each other, it would be predicted that a greater amount would be required to control the length of the polymer, (in comparison with an aryl halide terminating agent), so an amount of 100-300% of the terminating group would not be

unexpected. Therefore, it would have been obvious to one of ordinary skill in the art to use cyclooctadiene as the terminating group, and to adjust the amount necessary to control the length of the polymer, even up to 300% by mole relative to the amount of monomer unit, in a polymer as described by Miller et al., since the reagent would be predicted to react in the same manner.

21. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (6,107,452) as applied to claims 1-3 and 12-13 above, and further in view of Noguchi et al. (US 2002/0177687).

22. Concerning claims 14-16, Miller et al. describe electroluminescent devices comprising a light emitting layer of a polymer which has an unsaturated hydrocarbon terminating group. As discussed above, it would have been obvious to have the unsaturated hydrocarbon terminating group coupled directly to a monomer unit of the polymer. Miller et al. are silent on the use of the electroluminescent device in a segment display, a dot matrix display or a liquid crystal display backlight.

23. Noguchi et al. also describes electroluminescent devices, where the light emitting layer comprises a polymeric material. Noguchi et al. further discloses the use of the electroluminescent device in a segment display, a dot matrix display or as a backlight in a liquid crystal display (claims 18-20). Given this teaching it would have been obvious to one of ordinary skill in the art to use the electroluminescent device described by Miller et al. in a segment display, dot matrix display or backlight for a liquid crystal display, since it would be predicted to function in the same manner.

24. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uckert et al. (US 2004/0185302) as applied to claims 1-9 and 12-13 above, and further in view of Noguchi et al. (US 2002/0177687).

25. Concerning claims 14-16, Uckert et al. describe electroluminescent devices comprising the polymer material discussed above. Uckert et al. are silent on the use of the electroluminescent device in a segment display, a dot matrix display or a liquid crystal display backlight.

26. Noguchi et al. also describes electroluminescent devices, where the light emitting layer comprises a polymeric material. Noguchi et al. further discloses the use of the electroluminescent device in a segment display, a dot matrix display or as a backlight in a liquid crystal display (claims 18-20). Given this teaching it would have been obvious to one of ordinary skill in the art to use the electroluminescent device described by Uckert et al. in a segment display, dot matrix display or backlight for a liquid crystal display, since it would be predicted to function in the same manner.

27. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (6,107,452) as applied to claims 1-3 and 12-13 above, and further in view of Bozano et al. (Journal of Applied Physics, vol. 94. no. 5, pp. 3061-3068, 2003).

28. Concerning claims 10-11, Miller et al. describe the polymer materials discussed above. As discussed above, it would have been obvious to one of ordinary skill to couple the unsaturated hydrocarbon terminating group directly to a monomer unit of the

polymer. Miller et al. are silent on a composition of the polymer discussed and a second polymer of the same composition.

29. Bozano et al. describe electroluminescent devices, based on cross-linked polymer blends. Bozano et al. use the same polymers described by Miller et al., where two polymers are blended together in a single composition. (see table 1, page 3063) Bozano et al. disclose that using cross-linkable polymer blends produces a mixture which is resistant to phase segregation, and produces stable polymer blends.

30. Given this teaching, it would have been obvious to one of ordinary skill to use the polymer materials where the unsaturated hydrocarbon is coupled directly to the monomer unit of the polymer in a blended composition, as described by Bozano et al. since the polymers would be predicted to function in the same manner.

Conclusion

31. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Woo et al. (5,708,130), in the same family as JP 11-510535, also describes fluorene-based polymers with terminating groups suitable for crosslinking, including unsaturated hydrocarbon substituents, but does not disclose other polymer materials, such as poly(triphenylenes), or unsaturated hydrocarbons other than ethylene.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL E. NELSON whose telephone number is

(571)270-3453. The examiner can normally be reached on M-F 7:30am-5:00pm EST (First Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on 571-272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael E. Nelson
Examiner
Art Unit 1794

/Callie E. Shosho/

Supervisory Patent Examiner, Art Unit 1794